

**REMARKS**

Claims 24, 26-29 and 31-33 are pending in this application. Claims 24, 28 and 31 are independent claims. Claims 1-23, 25 and 30 were previously cancelled. Reconsideration and allowance of the present application are respectfully requested.

**Double Patenting Rejection**

Claims 24, 26 and 27 stand provisionally rejected on the ground of nonstatutory, obviousness-type double patenting as being unpatentable over claims 21 and 28 of copending U.S. Application No. 10/748,175, which is commonly owned with the present application, in view of U.S. Patent Application No. 6,735,267 ("Orie") (previously cited). A terminal disclaimer, obviating this nonstatutory double patenting rejection, has already been filed on March 27, 2008. Therefore, Applicant respectfully requests that the provisional rejection of claims 24, 26 and 27 on the ground of nonstatutory, obviousness-type double patenting as being unpatentable over claims 21 and 28 of copending U.S. Application No. 10/748,175 in view of Orie be withdrawn.

Claim 28 stands provisionally rejected on the ground of nonstatutory, obviousness-type double patenting as being unpatentable over claim 30 of copending U.S. Application No. 10/748,175, which is commonly owned with the present application, in view of Orie (previously cited). A terminal disclaimer, obviating this nonstatutory double patenting rejection, has already

been filed on March 27, 2008. Therefore, Applicant respectfully requests that the provisional rejection of claim 28 on the ground of nonstatutory, obviousness-type double patenting as being unpatentable over claims 30 of copending U.S. Application No. 10/748,175 in view of Orii be withdrawn.

**Rejections Under 35 U.S.C. § 103 – Orii in view of Ueda and Johansson**

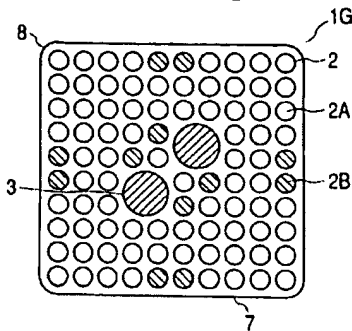
Claims 24 and 26-29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,735,267 to Orii et al. (“Orii”) in view of U.S. Patent 5,068,082 to Ueda et al. (“Ueda”) and U.S. Patent 5,229,068 to Johansson et al. (“Johansson”).

The Examiner rejects claims 24 and 26-29 as being unpatentable over Orii et al. (“Orii”) in view of Ueda et al. (“Ueda”) and further in view of Johansson et al. (“Johansson”). The Examiner asserts that Orii teaches the basic inventive concept of independent claims 24 and 28 including a generally square fuel bundle having a pair of water passages with circular cross-sections located centrally or proximal center, a first part-length rod group including two pair of part-length fuel rod subsets in a mirror-image along the centerline located between the two water passages and a second part-length rod group including four pair of part-length rods located in the outermost rows of a 10x10 matrix adjacent to one of the four sides of the tube. The Examiner relies on FIG. 15 (see figure below) of Orii, to make this assertion<sup>1</sup>.

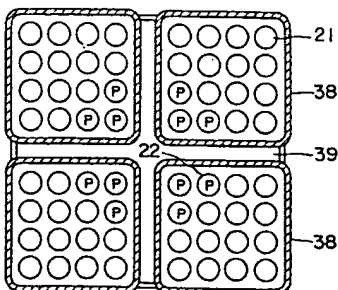
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<sup>1</sup> See page 4, of the December 20, 2006 Office Action.

**FIG. 15**



The Examiner cites Ueda, FIG. 19 (see figure below) and col. 12, lines 53-66, asserting that Ueda indicates that it is well-known in the art to provide certain groupings of part-length rods, and in particular 3-rod subgroups adjacent to a water passage<sup>2</sup>. The Examiner cites col. 2, lines 3-15 of Johansson<sup>3</sup>, asserting that Johansson teaches that the addition of part length rods lowers the pressure drop and thereby improves the critical power of a fuel bundle. Also, the Examiner asserts that the inclusion of a third rod in Orii is no more than the duplication of parts with predictable and intended effects, such that a skilled artisan wishing to duplicate the effect of one of the part-length rods in a 2-rod subgroup.



**FIG. 19**

<sup>2</sup> See page 4, of the December 20, 2006 Office Action.

<sup>3</sup> See page 6, of the December 20, 2006 Office Action.

With regards to Orii, the Examiner admits<sup>4</sup> that Orii does not teach part-length rod groups that include two groups of “*three part-length fuel rods in triangular orientation* with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset” (recited in claim 24). Furthermore, Applicants do not find a suggestion in Orii that the orientation of the part-length rods in FIG. 15 (or the other embodiments depicted in Orii) is open to any degree of manipulation, as the Orii part-length rod orientation is governed by a specific set of conditional Equations, listed in the Abstract (and discussed throughout the patent). Orii does not teach or suggest the use of the part-length rods in order to trap neutrons in order to improve the reactor shutdown margin. Rather, Orii cites as its main objective that the fuel assemblies containing part-length rods are capable of attaining allowable core stability *by increasing burn-up without increasing pressure loss* (col. 1, lines 54-58). Orii does not teach or suggest the use of part-length rods in order to assist in reactor shut-down, and Orii does not suggest the use of part-length rods to increase shut-down margin. The focus of Orii is to find part-length rod orientations that meet the conditional requirements of Equations 1-6, such that the fuel assembly burn-up is increased without increasing pressure drop. As stated in col. 13, lines 5-11, the FIG. 15 pattern of part-length rods satisfies the specific conditions expressed in Equations 1, 3, 4, 6, 11, and 15. These equations do not optimize

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<sup>4</sup> See page 4 of the December 20, 2006 Office Action.

shut-down margin, and the Examiner does not cite any portion of Orii that discusses such an attribute. The satisfaction of Equations 1, 3, 4, 6, 11 and 15 (as discussed in col. 13, lines 5-11) in order to arrive at the specific orientation of FIG. 15 in order to increase burn-up without increasing pressure drop, *appear similar* to the orientation of part-length rods in claim 24 by a product of nothing more than coincidence, as Orii is not optimizing or suggesting the improvement of shut-down margins, and shut-down margin is not a focus of Orii's conditional Equations.

With respect to Ueda, the Examiner's citation to FIG. 19 and col. 12, lines 53-66 of Ueda<sup>5</sup>, is simply a general reference to 3-rod subgroups near water passages, where the 3-rod subgroups are full-length "interposed" rods (as shown for instance in FIGS. 2A and 59A), which may be filled with a significantly reduced level of fissile material in at least a portion of the fuel rod. As explained in the Abstract, Ueda also teaches embodiments using shorter-length rods (as shown for instance in FIGS. 21A, 22A, 25A and 57A). However, the specification and figures of Ueda indicate that the embodiment of FIG. 19 is an embodiment using full-length "interposed" rods 22, and not part-length rods (see description in col. 12, lines 53-66). While other embodiments such as FIG. 25A of Ueda do use part-length rods, the FIG. 19 embodiment is specific to only "interposed" rods. Therefore, FIG. 19 suggests no more than the use of full-length 3-group rods 22, consisting of fissile-material that differs from

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<sup>5</sup> See page 4, of the December 20, 2006 Office Action.

conventional rods, which may be located near a water passage. Further, the FIG. 19 water passage is cruciform-shaped, and not “a pair of circular-shaped water passages”, as recited in claim 24, making the relevance of FIG. 19 more attenuated. Also, the 3-rod groups in FIG. 19 are not “two subsets in a mirror-image relationship... between the two water passages”, as recited in claim 24, as they are instead four 3-rod subgroups. Lastly, Ueda’s FIG. 19 involves an 8x8 matrix, which differs from the “10x10 matrix” recited in Applicants’ claim 24. While the Examiner has explained that Ueda is not being cited in order to teach the part-length rod orientation of claim 24, it is the Applicants’ assertion that the part-length rod orientation of FIG. 19 differs so significantly from that of claim 24 (with a very different water passage orientation, twice the number of 3-rod subgroups, and an 8x8 matrix as opposed to 10x10) that the general assertion that Ueda teaches “3-rod subgroups” carries little weight. Furthermore, because FIG. 19 is teaching the use of full-length “interposed” rods, as opposed to part-length rods, it is Applicants’ belief that FIG. 19 is altogether inapplicable to claim 24 and the orientation of “*part-length*” rod groups.

The Examiner cites FIG. 25A of Ueda<sup>6</sup> in order to support the assertion that Ueda teaches the use of 3-rod subgroups of part-length rods. While Applicants’ do agree that FIG. 25A discloses the use of part-length rods (unlike FIG. 19, which specifies only “interposed” rods), Applicants draw the

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<sup>6</sup> See page 5 of the December 20, 2006 Office Action.

Examiner's attention to FIGS. 25B, 25C and 25D which are cross-sectional views at various elevations of FIG. 25A (as explained in col. 14, lines 41-46). It is clear from FIGS. 25B, 25C and 25D that the cruciform orientation of the 16 part-length rods depicted in FIGS. 25A – 25D provides no reasonable relevance to the teaching or suggestion of “three part-length fuel rod” subgroups, as recited in Applicants' claim 24.

Assuming, *arguendo*, that Orii could be combined with Ueda (Applicants do not admit or even believe that these references may be combined), the combination of these references would still not teach claim 24, as neither of these references teach “a first part-length rod group including two subsets in a mirror-image relationship along the centerline between the two water passages, each subset further comprising three part-length fuel rods in a triangular orientation with one rod of the subset closer to the longitudinal centerline between the two water passages than the other two rods of the subset”.

Applicant asserts that it is improper to combine Orii with Ueda. A combination of references that destroys the intended function of one of the references, is not proper<sup>7</sup>. Orii places great weight on the satisfaction of the conditional Equations in order to arrive at a part-length rod orientation. The combination of Orii with a reference that may suggest the use of 3-rod groups rather than 2-rod groups<sup>8</sup>, or the combination of Orii with a reference that may

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<sup>7</sup> *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

<sup>8</sup> See the Examiner's assertion in introducing Ueda, on page 4 of the December 20, 2006 Office Action.

suggest the benefits of part-length rods<sup>9</sup>, generally, is in essence destroying the specific teachings of Orii. Specifically, the Examiner relies on disregarding Orii's Equations, and instead allowing for the mathematically derived Orii part-length rod orientations to be altered using only the more general principles of Ueda. Applicant asserts that such casual manipulation of rigorously derived orientations using only relaxed teachings would render the Orii reference inoperable for its intended purpose, and is therefore not proper under 35 U.S.C. §103.

With respect to Johansson, the Examiner cites col. 2, lines 3-15 in making the assertion that Johansson teaches the addition of part-length rods which lowers pressure drop and improves critical power<sup>10</sup>. Applicant asserts that the addition of Johansson's with the Orii and Ueda combination also causes Orii to be inoperable for its intended purpose. The Examiner's suggested combination of Johansson with Orii and Ueda would violate the Equations that Orii mandates must be met. As such, combining Johansson with Orii and Ueda would destroy Orii for its intended purpose. This is an impermissible and non-obvious combination, and therefore claim 24 cannot be rendered obvious to a person of ordinary skill in the art.

Additionally, the Examiner appears to have used impermissible hindsight reconstruction to reject claim 24. By the Examiner's own admission, he is "not attempting to combine ***every feature*** of this embodiment with the primary

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<sup>9</sup> See the Examiner's assertion in introducing Johansson, on page 5 of the December 20, 2006 Office Action.

<sup>10</sup> See Page 5 of the December 20, 2006 Office Action.



reference, but rather has gleaned relevant teachings regarding the configuration and position of the 3-rod subgroup”<sup>11</sup>. The Examiner seems to have used Applicants’ FIG. 2 as a blueprint, selected a prior art fuel assembly (Oarii, FIG. 15) as the main structural device, and then searched other prior art for the missing elements (two 3-rod subgroups near the water passages) without identifying or discussing a motivation to combine.

The Federal Circuit has noted that the PTO and the courts "cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention," In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988), and that the best defense against hindsight-based obviousness analysis is the rigorous application of the requirement for a showing of a teaching or motivation to combine the prior art references. Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor’s disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. Dembiczak, 50 USPQ2d at 1617.

In combining the teachings of Ueda and Johansson with Oarii, the Examiner has argued that inclusion of a third part-length rod in the Oarii configuration is “no more than the duplication of parts with predictable and intended effects.”<sup>12</sup> Applicants again draw the Examiner’s attention to col. 13, lines 5-11 of Oarii, which explain that the exact configuration of Oarii’s FIG. 15

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<sup>11</sup> See page 8 and 9 of the December 20, 2006 Office Action.

<sup>12</sup> See page 4 of the December 20, 2006 Office Action.

embodiment satisfies Equations 1, 3, 4, 6, 11, and 15. As explained in col. 13, lines 43-45, the ratio of part-length rods to full-length rods is just one of the carefully selected attributes of FIG. 15. Orii continues, by explaining that the FIG. 15 embodiment may be in essence duplicated, with a similar embodiment as shown in FIG. 17 and discussed in col. 14, lines 7-16. Orii is clear that the positions of the part-length rods in FIG. 17 need to be arranged just as depicted in FIG. 17 (col. 14, lines 7-16). It should be noted that the specifically arranged part-length rod pattern of FIG. 17 does not teach Applicant's claim 24. Orii continues to teach other part-length rod orientations, for instance those shown in FIGS. 18 and 20 (and discussed in col. 14, lines 18-52 and col. 15, lines 23-34), neither of which teach Applicant's claim 24. In each case discussed above, Orii specifies that the conditional Equations must be met in order to provide for the specific embodiments depicted in the figures. At no time does Orii suggest that other similar orientations involving part-length rods may be overtly manipulated or attempted, such that a skilled artisan would be motivated to openly experiment with placing more (or less) part-length rods within orientations already depicted within the provided figures. Orii places great emphasis on all rod orientations meeting the specific conditional Equations 1-6 listed in the Abstract and discussed throughout the reference. For at least these reasons, it is apparent that simply adding (or subtracting) more part-length rods to Orii's FIG. 15 would not be merely duplicating parts with a predictable and intended effect, but instead would disrupt the

specifically calibrated orientation of part-length rods that meet the particular conditional Equations taught by Orie.

With regards to independent claim 28, the same arguments can be made against the cited art which does not teach either singly, or in combination, “*two 3-rod subsets consisting of part-length rods in a mirror image relationship with one another along the longitudinal centerline between the two water passages, each 3-rod subset configured in a triangular orientation and directly adjacent to the pair of water passages*”.

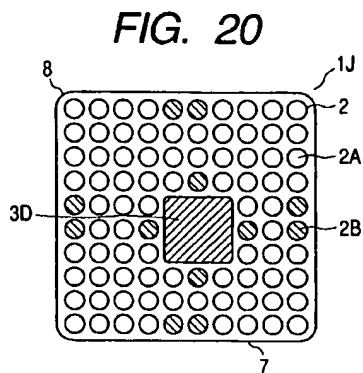
For at least the reasons stated above, Applicants believe independent claims 24 and 28 would not have been obvious to a person of ordinary skill in the art, such that these claims are believed to be patentable. For at least the same reasons, Applicants believe dependent claims 26-27 and 29 are also patentable. Therefore, Applicant respectfully requests that the art grounds of rejection of these claims under 35 U.S.C. § 103(a) be withdrawn.

**Rejections Under 35 U.S.C. § 103 – Orie in view of Johansson**

Claim 31-33 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Orie in view of Johansson.

The Examiner rejects claims 31-33 as being unpatentable over Orie et al. (“Orie”) in view of Johansson et al. (“Johansson”). The Examiner points to Orie as the primary reference cited against these claims (see FIG. 20, below). The Examiner asserts that Johansson teaches that “the addition of part length rods

lowers the pressure drop, thereby improving critical power,"<sup>13</sup> which the Examiner explains provides the requisite motivation for a skilled artisan to modify Orii's orientation such that two of the pairs of part-length rods near the tube sides may become lone part-length rods (rather than a pair of rods), and the four part-length rods on each side of the water passage may become two pairs, located on a corner of the water passage.



Applicants assert that neither Orii or Johansson, either singly or in combination with each other, teach or suggest "a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water-passage, and a second rod group comprising two pairs of part-length rods and at least two non-paired part-length rods, each of the two pairs and the at least two non-paired part-length rods located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the

<sup>13</sup> See page 5 of the December 20, 2006 Office Action.

tube". FIG. 20 of Orii does not teach two single part-length rods and two pairs of part-length rods along the sides of the tube, but rather, Orii teaches four pairs of part-length rods along the sides of the tube. Furthermore, FIG. 20 does not teach two pair of part-length rods each located near a corner of the water passage, but rather Orii teaches 4 separate part-length rods located equidistant along the 4 sides of the water passage. As stated explicitly in col. 15, lines 23-34, Orii arrives at the specific part-length rod orientation of FIG. 20 (Orii explains in col. 15, lines 23-34 that this orientation is similar to the embodiment of FIG. 18) only by meeting the conditions of Equation 1, 4, 8, 10, 16 and 17 (see discussion in col. 14, lines 18-52, relating to FIG. 18). Therefore, Orii is not suggesting that the use of part-length rods is open to free movement of the part-length rod locations (or the addition or subtraction of part-length rods, generally), but rather, Orii is teaching the specific placement of these part-length rods as depicted in FIG. 18 and FIG. 20, based on the conditional Equations being met. Furthermore, Orii's main focus is to increase burn-up without increasing pressure drop and therefore Orii does not teach or suggest the use of part-length rods to increase shut-down margin, for at least the reasons stated above related to claim 24.

The Examiner's suggested combination of Johansson with Orii would violate the Equations that Orii mandates must be met. As such, combining Johansson with Orii would destroy Orii for its intended purpose. As discussed above with respect to claim 24, this is an impermissible and non-obvious

combination. Claim 31, therefore, cannot be rendered obvious to a person of ordinary skill in the art by combining Orii in view of Johansson.

For at least the reasons stated above, Applicants believe independent claim 31 to be patentable. For at least the same reasons, Applicants believe that dependent claims 32 and 33 are also patentable. Therefore, Applicant respectfully requests that the art grounds of rejection of these claims under 35 U.S.C. § 103(a) be withdrawn.

**CONCLUSION**

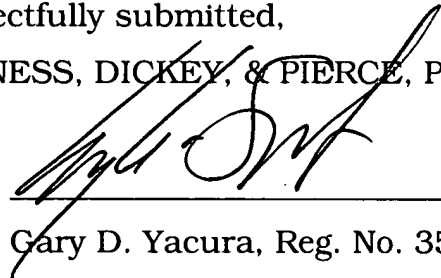
In view of the above remarks and amendments, Applicant respectfully submits that each of the rejections has been addressed and overcome, placing the present application in condition for allowance. A notice to that effect is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to contact the undersigned.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Gary D. Yacura at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,  
HARNESS, DICKEY, & PIERCE, P.L.C.

By

  
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